California Independent
System Operator Corporation

Congestion Revenue Rights Settlement Rule

Draft Proposal

Department of Market Monitoring

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I. Background

On August 18, 2009, the California ISO Department of Market Monitoring (DMM) issued a white paper outlining two basic options for a settlement rule to help deter the potential use of virtual bidding to increase congestion revenue rights (CRR) payments.[1] The first option was based on the approach used by the PJM Interconnection (PJM) and ISO New England (ISO-NE). A second, more "flow-based" approach developed by DMM was also described that we believe may provide a more targeted way of limiting CRR payments in cases when the CRR holders' virtual bids may otherwise increase their CRR payments. We received limited comments on this whitepaper:

- SCE and PG&E have expressed general support for the second "flow-based" approach, but suggested several specific additional modifications or refinements to the general approach outlined in DMM's August 18 whitepaper.
- WPTF indicated the approach used by PJM and ISO-NE appears to work well to catch "the most egregious/intentional cases" of potential virtual bidding to increase CRR payments, and expressed concern that the alternative approach proposed by DMM may, in practice, have the effect of "catching too many incidental and large harmless interactions" if various thresholds are not set appropriately (i.e., too strictly).
- EPIC, SCE and WPTF all suggested similar modifications to the approach used to determine the amount of CRR payments that would be subject to the settlement rule. A modification similar to that proposed by these entities is incorporated in this revised proposal.

Based on further consideration of these approaches and input from stakeholders, DMM's initial proposal is to adopt this second more "flow-based" approach, on the grounds that it will provide a more targeted approach for identifying virtual bidding having a significant impact on CRR payments and rescinding CRR payments associated with that virtual bidding. This paper provides further details of this approach.

[1] Congestion Revenue Rights Settlement Rule, Department of Market Monitoring, August 18, 2009.

II. Proposed Approach

Step 1. Compare CRR day-ahead and real-time price differences

Determine if the difference between the congestion components of LMPs (CLMPs) for the CRR sink/source is greater in the integrated forward market (IFM) or real-time. Specifically, convergence bidding by holders of a CRR would be subject to further review and potential CRR payment adjustments if:

$$dL_1 > 0$$

Where:

$$dL_1 = \Delta N_{DA} - \Delta N_{RT}$$
$$\Delta N_{DA} = \left(CLMP_{DA,Sink} - CLMP_{DA,Source}\right)$$
$$\Delta N_{RT} = \left(\frac{\sum_{h}^{H}\left(CLMP_{RT,Sink,h} - CLMP_{RT,Source,h}\right)}{H}\right)$$

$CLMP_{DA,Sink}$ is the IFM congestion component of the LMP at the CRR Sink.

$CLMP_{DA,Source}$ is the IFM congestion component of the LMP at the CRR Source.

For PNodes within the ISO settled at the 5-minute real-time prices, h designates the 5-minute interval during each hour, and $H=12$ intervals each hour. For CRRs involving Tie Points settled at 15-minute prices determined in the hour-ahead scheduling process (HASP), h designates the four 15-minute intervals during each hour.

ΔN_{DA} is therefore the value of the CRR for the hour under investigation, and ΔN_{RT} is the CRR value if it were settled in the real-time market (or HASP for CRRs involving Tie Points) instead of the IFM.

Therefore, dL_1 is the increase in the CRR's value settled in the IFM (with virtual bids included) over the CRR's value if it were settled in the real-time market or HASP (in the absence of the virtual bids).

Step 2. Identify constraints that increase CRR payments to or decrease CRR payments from a participant

Start by considering all constraints that are binding in either the IFM or real-time market. From this set of binding constraints, identify the constraints that contribute to the increased value of the CRR settled in the IFM compared to its value if it were settled in the real-time market. Specifically, the impact of a CRR holder's virtual bids on the IFM flows of a constraint, k, will be calculated in Step 3 if:

$dL_2 > 0$

Where:

$$dL_2 = \Delta C_{DA} - \Delta C_{RT}$$
$$\Delta C_{DA} = \left(\left(-S_{k,DA,Sink}\right)\left(\lambda_{k,DA}\right) - \left(-S_{k,DA,Source}\right)\left(\lambda_{k,DA}\right)\right)$$
$$\Delta C_{RT} = \left(\frac{\sum_{h}^{H} \left[\left(-S_{k,Sink,h}\right)\left(\lambda_{k,RT,h}\right) - \left(-S_{k,Source,h}\right)\left(\lambda_{k,RT,h}\right)\right]}{H} \right)$$

Where:
$S_{k,DA,Sink}$ is the IFM shift factor of constraint *k* with respect to the CRR Sink node.
$\lambda_{k,DA}$ is the shadow price of the constraint *k* in the IFM for the hour under investigation.
ΔC_{DA} is therefore the constraint *k*'s contribution to the CRR's "IFM" value (ΔN_{DA}), and ΔC_{RT} is the constraint *k*'s contribution to the CRR's "Real Time" value

If the constraint is binding in the real-time market, but not in the IFM, then the average over the hour of the real-time shift factors for a node should be used in place of the day-ahead shift factors.

Constraints that are binding in the real-time market but not in the IFM must be considered in order to adjust payments from/to holders of CRRs who may use virtual bids to profit from the elimination of congestion on a constraint in the IFM.

Step 3. Calculate combined impact of CRR holder's portfolio of virtual bids on flows

Next, the combined impact of the participant *i*'s portfolio of accepted virtual supply and demand bids on the IFM flows of all constraints identified in Step 2 is calculated. For a given CRR from *A* to *B*, the total megawatt (MW) flow contribution from all the accepted virtual bids of the CRR holder to the total MW flow on each constraint *k* is calculated as follows:

$$F_{DA,k,i} = \sum_{j \in i} S_{k,DA,j} VB_j$$

Where $S_{k,DA,j}$ is the IFM shift factor of constraint *k* with respect to accepted virtual bids at node *j* and (VB_j) is the volume (MW) of accepted virtual bids by the CRR holder at node *j.* Accepted virtual supply bids are represented as *positive* values of VB_j while virtual demand bids are represented as *negative* values of $VB_{j.}$ All the shift factors are based on the default slack (load distributed slack).

The convergence bids of each CRR holder *i* include virtual bids by any entities to which the CRR holder is affiliated.

Step 4. Determine constraints significantly impacted by CRR holder's portfolio of virtual bids

For this step, the net impact of the participant's portfolio of accepted virtual supply and demand bids ($F_{DA,k,i}$) is compared to the total flow on each constraint investigated in Step 2 and Step 3. A threshold percentage (*L,)* of the constraint's flow limit (*K*) is used to determine if congestion on each constraint may have been significantly impacted by the CRR holder's accepted virtual bids. Specifically, the portion of the CRR payment attributable to constraint *k* will be adjusted if:

$$\left|F_{DA,k,i}\right| > (K * L) + (K - F_{DA,k})$$

Where $F_{DA,k}$ is the total IFM market flow on constraint, *k*.

DMM suggests that *L* will initially be .10 (10 percent) for all constraints. Based on actual operating experience and off-line studies of the potential price impacts resulting from different levels of virtual bids, the threshold *L* may be adjusted for some or all constraints.

Step 5. Apply CRR payment adjustment

Payments to the CRR holder will be decreased (or payments from the CRR holder may be increased) on a constraint-by-constraint basis. Specifically, the payment adjustment will be the amount (dL_2) that the individual constraint contributes to the increased value of the CRR settled in the IFM compared to its value if it were settled in the real-time market.

As CRR payments will only be adjusted for constraints where $dL_2 > 0$, in order to ensure that this settlement rule does not result in the CRR holder receiving less than (or paying more than) the CRR's "real-time market value" (ΔN_{RT}), the total payment adjustment to participant, *i,* for the CRR and hour under investigation will not exceed dL_1.

Consider a specific CRR from source A to sink B owned by participant, *i*. Let $\{G\}$ denote the set of constraints, *k*, over which $\left|F_{DA,k,i}\right| > (K * L) + (K - F_{DA,k})$. The CRR holder's payment for the CRR from source A to sink B will be adjusted by:

$$PA_{A,B} = \max\left(\min(-dL_1, 0), \sum_{k \in \{G\}} \left(\min(-dL_{2_k}, 0)\right)\right)$$

Examples 1 and 2 attached to this whitepaper illustrate how the proposed settlement rule would be applied for two scenarios.

III. Other Issues

Congestion payments from CRR holders

The general approach described above can be used to identify cases in which virtual bidding by a participant may have reduced the payments that the CRR holder would have otherwise needed to pay for "negative congestion" between the CRR holder's source and sink (i.e., due to net system flows in the opposite direction of the participant's CRR source/sink). This can occur under two different scenarios:

- **Case A:** In cases where congestion occurred in the opposite direction of a participant's CRR holdings, but was reduced by the participant's virtual bids.
- **Case B:** Where congestion did <u>not</u> occur in the opposite direction of a participant's CRR holdings, but would have occurred but for the impact of the participant's virtual bids.

Example 2 illustrates this scenario. While the general settlement rule described in Section II can be applied in these cases, this would result in the CRR holder receiving an additional congestion charge (rather than having CRR payments reduced). In practice, we expect that this would usually occur in cases when a CRR holder effectively sold a "counterflow" CRR by bidding and receiving a negative price in the CRR auction for a CRR in the opposite direction of the expected direction of congestion. In these cases, the CRR holder would have already received a payment for this CRR, and is then obligated to be charged back for any actual congestion that occurs in the opposite direction of the participant's CRR. While we believe it is necessary to monitor and have the ability to mitigate potential use of virtual bidding to reduce payments made by holders of such "counterflow" CRRs, we recognize that further consideration of this issue by stakeholders is warranted.

Treatment of Affiliates

We recommend that the CRR settlement rule be applied on an aggregated portfolio basis for participants with multiple Scheduling Coordinator IDs, and any participants that are affiliated. In its comments in response to DMM's August 18 whitepaper, SCE supported the need for considering virtual bidding and CRRs held among affiliates, but indicated that it would be appropriate to provide exemptions for entities such as SCE that are already subject to affiliate restrictions through "other forms of controlling legal authority," such as CPUC regulations prohibiting inter-affiliate transactions and potential "cross subsidization" between the parent utility and its unregulated affiliates (p.2). We believe this issue merits further consideration, and have requested assistance from the ISO legal department in reviewing applicable regulations to determine if such a distinction can be clearly made and is appropriate.

IV. Next Steps

We are seeking input on this whitepaper from stakeholders and the ISO Market Surveillance Committee (MSC). Provided below is an initial schedule for further consideration of this issue as part of the ISO's process for finalizing its proposal for convergence bidding.

- September 18 – MSC/Stakeholder meeting.
- October 2 – Written comments from stakeholders on DMM proposal.

Example 1. Virtual Bids Exacerbating in Direction of CRR

Step 1

$CLMP_{DA,Sink}$	$51
$CLMP_{DA,Source}$	-$9
ΔN_{DA}	$60
$CLMP_{RT,Sink}$	$34
$CLMP_{RT,Source}$	-$6
ΔN_{RT}	$40
$dL_1 = \Delta N_{DA} - \Delta N_{RT} =$	$20
$\Delta N_{DA} > \Delta N_{RT}$?	Yes

Step 2

	Constraint 1	Constraint 2	Constraint 3
$CLMP_{DA,Sink}$	$30	$15	$6
$CLMP_{DA,Source}$	-$15	-$3	$9
ΔC_{DA}	$45	$18	-$3
$CLMP_{RT,Sink}$	$20	$10	$4
$CLMP_{RT,Source}$	-$10	-$2	$6
ΔC_{RT}	$30	$12	-$2
$dL_2 = \Delta C_{DA} - \Delta C_{RT} =$	$15	$6	-$1

Step 3

$F_{DA,\,k,\,i}$	150 MW	50 MW	50 MW

Step 4

$F_{DA,\,k}$	1,000 MW	1,000 MW	400 MW
K	1,000 MW	1,000 MW	400 MW
L	.10	.10	.10
$(K \times L) + (K - F_{DA,\,k,\,i})$	100 MW	100 MW	40 MW
$\lvert F_{DA,\,k,\,i} \rvert$	150 MW	50 MW	50 MW
$\lvert F_{DA,k,i} \rvert > (K \times L) + (K - FDA,k,i)$?	Yes	No	Yes

Step 5

CRR Payment Adjustment $[\min(-dL_2,0)]$	($15)	$0	$0

Total CRR Payment Adjustment $[\max(\min(-dL_1,0),\sum(\min(-dL_2,0)))]$	($15)

Example 2. Virtual Bids Decreasing Congestion for "Counterflow" CRR

Step 1			
$CLMP_{DA,Sink}$	-$1		
$CLMP_{DA,Source}$	$18		
ΔN_{DA}	-$19		
$CLMP_{RT,Sink}$	-$7		
$CLMP_{RT,Source}$	$56		
ΔN_{RT}	-$63		
$dL_1 = \Delta N_{DA} - \Delta N_{RT} =$	$44		
$\Delta N_{DA} > \Delta N_{RT}$?	Yes		
Step 2			
	Constraint 1	Constraint 2	Constraint 3
$CLMP_{DA,Sink}$	$0	-$5	$4
$CLMP_{DA,Source}$	$0	$15	$3
ΔC_{DA}	$0	-$20	$1
$CLMP_{RT,Sink}$	-$5	-$10	$8
$CLMP_{RT,Source}$	$20	$30	$6
ΔC_{RT}	-$25	-$40	$2
$dL_2 = \Delta C_{DA} - \Delta C_{RT} =$	$25	$20	-$1
Step 3			
$F_{DA,\,k,\,i}$	-150 MW	-50 MW	-50 MW
Step 4			
$F_{DA,\,k}$	980 MW	1,000 MW	400 MW
K	1,000 MW	1,000 MW	400 MW
L	.10	.10	.10
$(K \times L) + (K - F_{DA,\,k,\,i})$	120 MW	100 MW	40 MW
$\lvert F_{DA,\,k,\,i} \rvert$	150 MW	50 MW	50 MW
$\lvert F_{DA,k,i} \rvert > (K \times L) + (K - FDA,k,i)$?	Yes	No	Yes
Step 5			
CRR Payment Adjustment [min($-dL_2$,0)]	($25)	$0	$0
Total CRR Payment Adjustment [max(min($-dL_1$,0),$\sum$(min($-dL_2$,0)))]	($25)		